REMARKS

Claims 17-21 and 23-45 are pending in the present application. Claims 17 and 41 are amended herein to clarify that the method of depositing a thin film on a substrate is an atomic layer epitaxy (ALE) method or that the cycles are saturative.

Applicants note with appreciation that the prior rejections have been withdrawn in view of Applicants' prior response. The new rejections are addressed below.

Claims Rejections — 35 U.S.C. § 102

The Examiner has rejected Claims 17-25 and 32-43 under 35 U.S.C. § 102(b) as being anticipated by Kitahara et al. (U.S. Patent No. 5,300,186). Essentially, the Examiner's position is that Kitahara et al. teaches purging with hydrogen for about three seconds, that the minimum flow rate of hydrogen is 2 slm and that actually more than this is employed during purge steps, and that "even though the volume of the chamber is not explicitly taught, it is the position of the Examiner that the flow rates and the flow times explicitly taught read on moving multiple reaction space volumes of inactive gas through the reaction space for any reasonably sized reactor used for coating silicon wafers."

Applicants respectfully traverse this rejection. Because the size of the chamber is not explicitly taught, the Examiner's reasoning must rely on the laws of inherency.

"Inherency, however, may not be established by probabilities or possibilities. The fact that a given thing ***may*** result from a given set of circumstances is not sufficient." *In re* Oelrich, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981). *See also* Tintec Industries, Inc. v. Top-USA Corp., 63 U.S.P.Q.2d 1597, 1599 (Fed. Cir. 2002) ("Inherent anticipation requires that the missing descriptive material is 'necessarily present' not merely probably or possibly present in the prior art." (*quoting In re* Robertson, 49 U.S.P.Q.2d 1949, 1950-51 (Fed. Cir. 1999)). The Examiner's assertion that the flow rates and flow time explicitly taught would inherently read on the claims "for any reasonably sized reactor" does not rise to the standards required for inherent anticipation.

Furthermore, Applicants submit that Kitahara et al. do not meet the claims as amended because they do not actually disclose atomic layer epitaxy (Claim 17) or in which each cycle forms a saturated monolayer (Claim 41). The amendments are supported by the original application. Note that ALE is quoted throughout the application is filed, and formation of a fully

saturated monolayer is supported, e.g., in the explanation of ALE at page 3, lines 8-10, among other places. Furthermore, ALE is known to involve self-saturated pulses.

Contrary to the amended claims, Kitahara et al. does not teach a true ALE process. Rather, Kitahara is more in the nature of CVD or pyrolysis since Kitahara expressly teaches conditions (including a deposition temperature of about 500°C at Col. 4, lines 51-55) under which the disclosed reactants (including trimethyl aluminum gas or TMA at lines 57-62) would decompose upon the substrate. In fact, Kitahara et al. expressly teaches the TMA decomposes: "The TMA thus introduced is thus decomposed in the reaction chamber 20 and produces aluminum which covers the surface of the silicon wafer 22 as monatomic layer as will be described later." Col. 4, ll. 62-65. Thus, if a true monolayer is achieved during each process, it is not saturatively formed, according to the ALE process, but is rather limited only by the duration of the pulsing. The skilled artisan will understand that this process is not atomic layer epitaxy nor saturative. *See also*, Col. 6, ll. 53-57 (teaching that "aluminum atoms formed as a result of pyrolysis of TMA.").

Furthermore, because TMA is being pyrolyzed during the TMA step in Kitahara et al., the subsequent hydrogen pulse is not a true purging process. Rather, hydrogen is a reactive step that removes contaminants caused by the prior decomposition of TMA (i.e., the methyl groups) from the wafer surface. Accordingly, Kitahara et al. does not involve any "inactive gas" purging step.

In view of the distinctions set forth above, Applicants respectfully submit that the pending claims are not anticipated by Kitahara et al. The nonobviousness of the claims is set forth in more detail below.

Claim Rejections — 35 U.S.C. § 103

The Examiner has also rejected the claims under 35 U.S.C. § 103(a) as being unpatentable over Kitahara et al., or unpatentable over Kitahara et al. in view of Moore, Sr. (U.S. Patent No. 3,662,583).

For the single-reference rejection, the Examiner states that "it would have been obvious at the time the invention was made to a person having ordinary skill in the art to determine the volume of gas required to maximally remove the reactant gas in any residual component species remaining. By doing so, one would reduce contamination. Determining this amount would have been within the skill of one practicing in the art, through routine experimentation."

Applicants respectfully submit that the Examiner has not met his burden for showing a motivation in the art for the specific recitations in depending claims.

Initially, noted above, Kitahara et al. involves neither ALE nor saturative formation of monolayers. Accordingly, Kitahara does not teach or suggest all of the features and limitations of the pending claims.

Furthermore, the Examiner's reasoning is that it would be obvious for the skilled artisan to optimize, through routine experimentation, the volume of gas required to maximally remove the reactant gas. The Examiner assumes, without any support, that the skilled artisan would have been motivated, at the time of the invention, to remove all residual species that are "adsorbed on the walls of the reaction space" as recited in the claims.

In fact, the prior art does not recognize the need to remove adsorbed species from the walls of reaction space. Rather, the prior art, as a rule, is concerned with removal of gas phase species from the reaction space, and would furthermore also be concerned with the duration of each cycle. Accordingly, in the absence of express teachings to remove species adsorbed on the reaction walls, the skilled artisan would not optimize an ALE process to ensure removal of reactant molecules that are adsorbed on the walls. Rather, the skilled artisan would be more concerned with removing gas phase reactants and minimizing the duration of each cycle.

The Examiner's rejections show no appreciation for the skilled artisan's distinctions between removal from the gas phase and removal of adsorbed species from the walls, and furthermore show no appreciation for the need to minimize the duration of each cycle. Accordingly, the rejections do not consider the teachings of the entire field. In re Dow Chemical, U.S.P.Q.2d, 1529, 1531 (Fed. Cir. 1988) ("In determining whether such a suggestion can be fairly gleaned from the prior art, the full field of the invention must be considered").

In view of the foregoing remarks, Applicants respectfully submit that the pending claims are not obvious over Kitahara, alone or in combination with Moore (which is asserted solely for teachings of oblong inlets).

CONCLUSIONS

In view of the foregoing amendments and remarks, Applicants respectfully submit that the pending claims are in condition for allowance and request the same. If, however, some issue

remains that the Examiner feels can be addressed by Examiner amendment, the Examiner is cordially invited to call the undersigned for authorization.

Respectfully submitted,

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